



HIGH PERFORMANCE

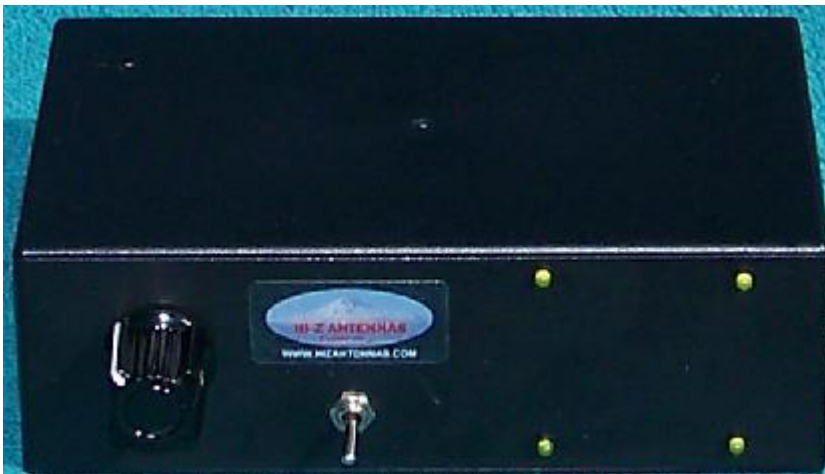
HF RECEIVING SYSTEMS & COMPONENTS

Hi-Z Antennas™ Hi-Z 4 Element Array Manual

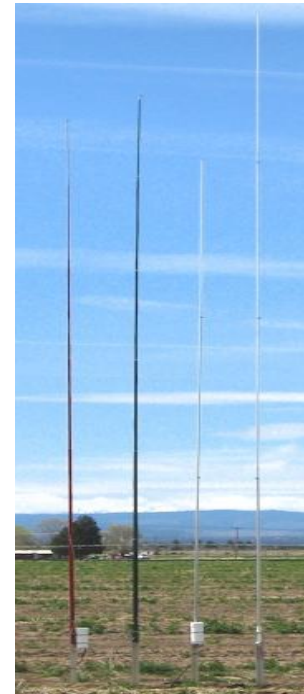
Level 2 Hi-Z Amp PLUS6

(Hi-Z PLUS6 information is located at the end of this manual)

1/14/2014



Hi-Z 4 Element Array System



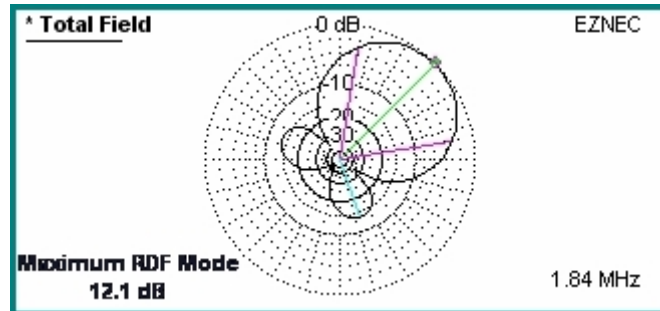
Hi-Z Verticals

Congratulations and Thank You for the purchase of our system. ***We recommend that you read this manual and fully understand the requirements for the proper installation of your system.***

Specifications

- **Maximum RDF 12.1db**
- **Directions 4**
- **Power Requirements 13.8 VDC**

Pattern



Material That the Customer Supplies -

1. Control cable (4 conductor-- 2 wires for control and 2 for power)
2. Short two conductor cable for DC power. Hi-Z supplies the connector for the shack switch.
3. Mounts for the verticals.
4. Four short ground rods. Depending on soil type, in the range of 3 – 4 feet long.
5. RG6 coax and connectors (connecting the verticals to the phase controller and from phase controller / in-line pre-amp to shack receiver location. RG6 coax is more than adequate to lengths out to 1000 feet long.
6. Make eight 9-10" long wires. Wire size can be made from 18 – 20 gauge wire. Terminate each end with #6 ring terminals. Recommend that after the terminals are crimped, that these terminals are soldered for reliability. For Hi-Z Amp terminations.
7. **Weatherproofing the electronics.** You will need an adequate cover or enclosure that will keep rain and snow off the phase controller, in-line pre-amp and filters if installed, and the Hi-Z PLUS6 Amps at the base of each vertical. Water getting inside of these enclosures WILL cause DAMAGE.

OPTIONS

Filters for site specific issues, for example local and or high power AM broadcast stations. Hi-Z Antennas™ makes a BPF look at http://www.hizantennas.com/band_pass.htm and a HPF look at http://www.hizantennas.com/high_pass.htm

SITE PREPARATION

Place the verticals as far away from metallic structures or other towers and antennas as possible, especially resonant antennas. The farther the better. Keep away from field fencing at least 10-20 feet. Keep the verticals more than 10 feet from trees and heavy vegetation.

Control Cable and Coax Considerations

1. Conductor wire gauge size is a function of the length of the control cable. 18 gauge wires is adequate out to 500 feet. Any longer will need to increase wire gauge size to accommodate the voltage drop over the run of cable length. An inexpensive source of cable is from Lowes, Home Depot, etc in their electrical department. They have 5, 7, 9 conductor, 18 gauge direct burial sprinkler control cable. Usually they will have it on large spools and can be cut to the length you require. Always get extra.
2. Make sure that the RG6 connectors are tight.
3. If you crimp on terminals on the control cable, go the extra step and solder each terminal for reliability.

Vertical Placement and Installation of the Hi-Z PLUS6 Amplifiers

Typically the phase controller is mounted in the center of the array, but that is not necessary as long as ALL four RG6 coaxes are cut to the same length and can reach from the controller to all three verticals.

1. Determine where the array (verticals) will be mounted.
2. The verticals need to be as far away as possible from other antennas, tower and other metallic structures. Especially if the other antennas are resonant, this will lower performance.
3. Locate the ground rods close to the base of each vertical.
4. Determine the direction orientation. You have 4 directions. So orientation of the verticals is critical to achieving the directional performance you require and can be different in locations around the world. There is a procedure to assist you in laying out the verticals at your site at the end of this manual.
5. See the diagram on the last page. This will assist you in laying out the accurate placement of your three verticals.
6. Acquire control cable (4 conductor) long enough to get from the shack switch to the phase controller.
7. You will need a length of RG6 coax about the same length to connect the output of the in-line pre-amp (at the phase controller) to your receiver port.
8. Typically the phase controller is located in the center of the array. That is not necessary. However where ever the phase controller is located the four RG6 coaxes from the controller to the base of each vertical MUST be cut and terminated to the same length
9. Mount the 4 the verticals (either homebrew or Hi-Z verticals).
10. Mount the Hi-Z Amplifiers PLUS6 at the base of each vertical. Connect one wire from the Antenna terminal to the base of the vertical. Connect another wire from the Ground terminal to the ground rod. See Hi-Z Amplifier.
11. Connect a RG6 coax from output of Hi-Z amp PLUS6 to the correct Ant 1, 2, 3 and 4 at the controller.
12. Weatherproofing of the Hi-Z Amp PLUS6 is not necessary, except to seal the RG6 coax connection.



Hi-Z Amp PLUS6

Connecting the Verticals and Delay Cable to the Phase Controller

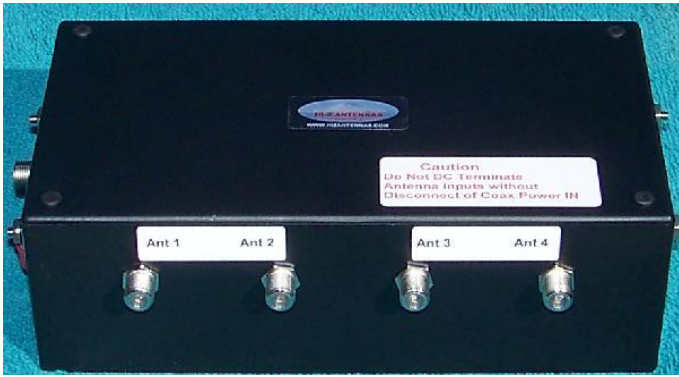


Fig. 1



Fig. 2

1. Run equal lengths of RG6 from the controller to each vertical. This connects to the controller Ant 1-4 to verticals 1-4. Be certain to observe these connections based on the orientation or placement of verticals for correct aiming. Fig.1 Ant1, direction 1 is Northeast, Ant2 is direction 2 and is Northeast, Ant3 is position3 and is Southeast, Ant4 is direction 4 and is Southwest.
2. Connect the Hi-Z supplied short and long Delay cables at Short Delay and Long Delay connectors on the phase controller. Fig.2

Connecting the Phase Controller to the Shack Switch and Receiver Fig. 3, 4 & 5

1. Wire point to point control 1 and 2 between controller and shack switch. Fig. 3, 4 & 5
2. Wire the power (13.8 VDC and Ground from shack switch to the controller.
3. Connect a short length of RG6 from the phase controller output to the input of the inline pre-amp. Fig. 6
4. OPTIONS. If a HPF or BPF filter was purchased or customer supplied, the filter MUST be inserted between the controller output and before the inline preamp (best IMD).
5. Connect a short wire from the 13.8 VDC controller terminal to the 13.8 VDC terminal at the inline pre-amp. Fig. 6
6. Connect RG6 from the output of the inline pre-amp to your receiver. Fig. 6
7. OPTION. If you purchased our Hi-Z 75 to 50Ω transformer, then insert the transformer in the feed coax in the shack. We highly recommend this transformer for best overall performance.



Fig. 3



Fig. 4

The phase controller will be supplied with a RED jumper connected between the 13.8 VDC and Coax Power In terminals. This supplies the voltage to the Hi-Z amps over the coax.



Fig. 5



Fig. 6

Shack Preparation and Basic Operation

1. Locate the placement of the shack switch.
2. Hi-Z Antennas™ provides a power connector, on the back of the switch. Build a power cable to suit your needs and connect to your DC power supply. Center connector is +13.8VDC and the shield is Ground. Fig.5
3. Verify the voltage level is in the 13.8 VDC area. Depending on the length of the control cable this voltage may need to be adjusted upwards to compensate for any voltage drop.

4. Direction control. Typically the yellow LED (Upper Right) position is direction 1 (Northwest). Turning the selection switch clockwise in order will select directions 1 – 4. Typically direction number 1 is oriented to NW. Then in order position 2 is Northeast, 3 is Southeast and 4 is Southwest.

Power Up and System Checks

1. Turn power on at the shack switch. One yellow direction LED should be ON.
2. Measure the voltage at the phase controller. 13.8VDC is ideal. Voltage must be ≥ 12.0 VDC.
3. Check the RED LEDs at the Hi-Z Amp PLUS6 at the base of each vertical, they should ALL be ON.
4. Connect to receiver (through optional Hi-Z 75 to 50 Ω transformer, recommended).
5. Tune to 160 or 80 meters. Switch On and Off the power at the Hi-Z shack switch and you should hear the noise floor increase when switched ON. If able, compare to existing antennas, the noise floor on the Hi-Z system will likely be lower.
6. Test the directivity by tuning the top end of the AM broadcast band (with no HPF or BPF filter installed). When pointed at a station and the signal is peaked, turn the control to other directions and observe the F/B and F/S.
7. On the air, especially low angle DX, you will observe best performance in terms of pattern. When a signal is peaked in one direction, try switching in the direction either side you will see the signal decrease considerably. As you continue to turn the direction control and observing the signal level, the F/S and F/B performance will become apparent.
8. The advantage is the S/N that our system produces. Good DX'ing.

TROUBESHOOTING also see http://www.hizantennas.com/hiz_faq.htm

Symptom:

Spurs every 10 KHz across 160 meters. Check the Hi-Z PLUS6 connections. One of the Hi-Z Amp PLUS6 has the two wires (Antenna, Ground) backwards, verify these connections are wired correctly.

Measure the DC voltage on the vertical. From ground to the vertical with a DVM you should measure ~ 4 volts VDC.

Some switching power supplies can cause this symptom.

Low IMD. Verify that the voltage at the +13.8VDC and Ground terminals at the phase controller measures ≥ 12.0 VDC. Sometimes due to control cable lengths one may need to consider a separate adjustable voltage power supply to insure correct operation voltage for the Hi-Z system.

Hi-Z Amps – No RED LED ON

Verify that there is a jumper on the phase controller between the 13.8 VDC and Coax Power In terminals.

Birdies, Heterodyning

Causes include close proximity to broadcast stations.

Solutions: One the source of this problem is located, the insertion of either a Hi-Z BPF or Hi-Z HPF, depending on the source of interference, should be inserted between the output of the phase controller and the input to the 75 Ω in-line pre-amp.

Directions Seem Wrong

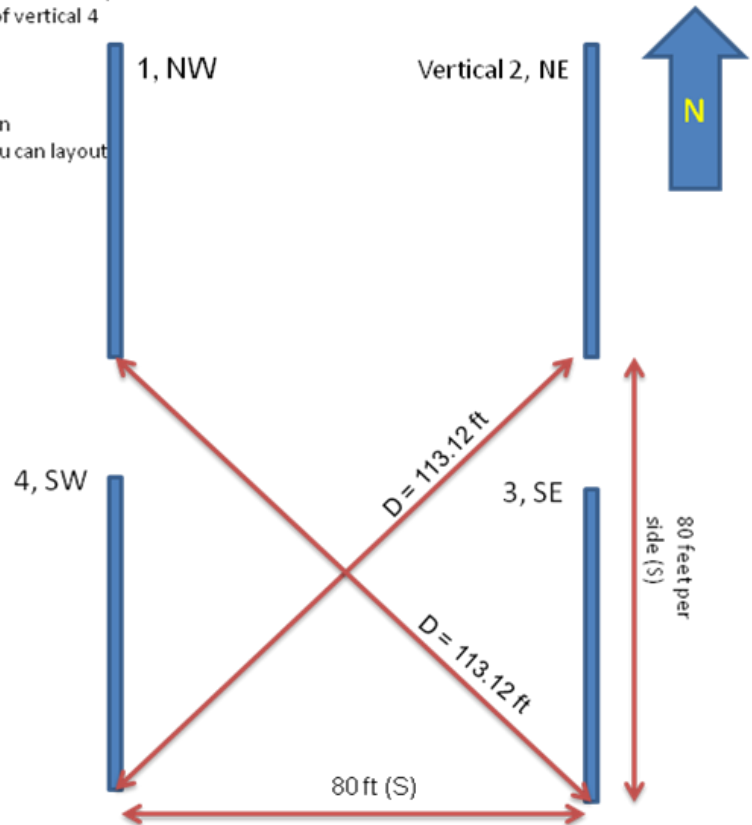
Verify that you connected vertical 1 to controller Ant1, vertical 2 to controller Ant 2 and so on.

For other topics see technical & application notes at http://www.hizantennas.com/application_notes.htm

Assumes Direction 1 = Northeast

1. Determine the center of the array
2. Determine direction 1, typically NE (45 degrees Azimuth)
3. Assuming a 80 foot square layout (S), mark vertical locations 1
4. Locate Vertical 3, this will on a diagonal (D) line 113.12 ft long from vertical 1.
5. Make two measures 80 feet long (with twine or wire)
6. Placing the measures over the vertical 1 & 3 stakes
7. On the CW (clockwise) side of the diagonal, move the ends together, where they meet is vertical 2
8. On the CCW side where the two measures just meet is the location of vertical 4

For side lengths with different dimensions.
If the Side length = S feet, then determining the Diagonal length = D, then
 $D = S \times 1.414$. By plugging in these values into the instruction above you can layout
a square with different side lengths.





HIGH PERFORMANCE

HF RECEIVING SYSTEMS & COMPONENTS

Hi-Z Antennas™ *Hi-Z Amplifier*



Hi-Z Amplifier PLUS6

The Hi-Z PLUS6 Amplifier was designed to provide amplification and matching between the short verticals and the phase controller in the Hi-Z phased array control systems. This amplifier is used on ALL Hi-Z phased array products. The amp is located at the base of each short vertical. The connecting wires must be short, in the range or 8-10 inches long. When dressing or routing the wires between the vertical and ground rod to the Hi-Z Amps, maintain as much separation between the ground and antenna wires as possible. If these wires are too close it will degrade the system performance.

Please review our application and technical notes to gain ideas for mounting the Hi-Z amplifiers near the base of the verticals. See: http://www.hizantennas.com/hiz_verticals.htm

Features:

- Relay input (lightning and static protection, when power is off)
- Easy connections to the base of the vertical and ground



Terminals to Ground and Vertical



Hi-Z Amp RG6 Output



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Hi-Z Antennas™ Hi-Z Amplifier PLUS6



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Specifications:

- Increased gain model – PLUS6 0dB (both models maintain 75 ohm output impedance)
- L=4.6 W=2.6 H=1.6 (not including the terminals or connectors)

Features & Benefits:

- Rugged weatherized enclosure
- No need to cover the amp, simplified mounting
- Reduces cost (enclosures) and time to mount and connect the Amp to the vertical elements



Terminals to Ground and Vertical



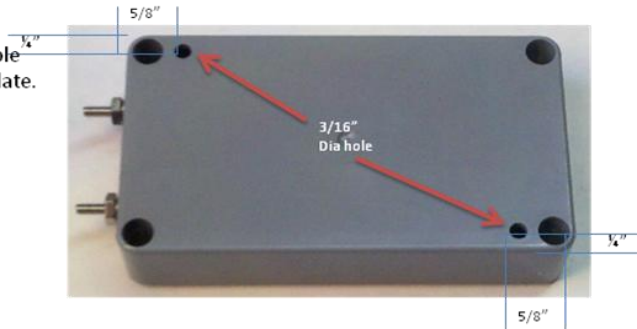
Hi-Z Amp RG6 Output

Hi-Z Amp PLUS & PLUS6 Enclosure Layout



Overall dimensions:
4.5" long X 2 9/16" wide

Two mounting holes accessible
By removing the top cover plate.
Each hole is 3/16" diameter.



Mounting Detail:

THANK YOU for selecting Hi-Z Antennas™.



Hi-Z Antennas™
8125 SW Larch Drive
Culver, OR 97734
USA